R E P O R T R E S U M E S

ED 014 864 EF 000 484

THE SCHOOL SITE--ITS SELECTION, ANALYSIS, DEVELOPMENT AND MAINTENANCE.

BY- BRUNING, WALTER F.

PUB DATE FEB 66

EDRS PRICE MF-$0.25 HC-$1.32 31P.

DESCRIPTORS- *SCHOOL LOCATION, *SCHOOL SITE, *SITE DEVELOPMENT, *SITE SELECTION, WISCONSIN

SCHOOL ADMINISTRATORS AND COMMUNITY PLANNERS CAN AID THE SCHOOL SITE SELECTION PROCESS BY WORKING TOGETHER ON A COMMUNITY MASTER PLAN. MANY COMMUNITIES HAVE DEVELOPED SUCH A PLAN UNDER THE STATE AND FEDERALLY AIDED 701 PROGRAM. SOUND SITE SELECTION PRINCIPLES REQUIRE CONSIDERATION OF OTHER FACTORS THAN STUDENT POPULATION DISTRIBUTION. IDEALLY LOCATED, EASY TO DEVELOP SITES WITHIN EASY REACH OF UTILITIES SHOULD BE CHOSEN. CAREFUL STUDY SHOULD BE MADE OF ALTERNATE SITES. TO ASSIST IN THE SELECTION PROCESS, A SITE PLANNER SHOULD BE EMPLOYED. WHEN A SITE IS FINALLY CHOSEN, DETAILED MAPS SHOULD BE OBTAINED, PERSONAL SURVEYS SHOULD BE MADE, AND A PRELIMINARY SITE STUDY BY AN ENGINEER SHOULD BE MADE. SITE DEVELOPMENT INVOLVES PLANNING FOR THREE BASIC AREAS, THE APPROACH AREA, THE SERVICE AREAS, AND THE OUTDOOR LIVING AREAS. LANDSCAPE MATERIALS USED IN DEVELOPMENT CONSIST OF INVISIBLE AND VISIBLE MATERIALS. QUALITY PRODUCTS SHOULD BE USED IN THE INVISIBLE MATERIALS BECAUSE LATER PROBLEMS CAN BE AVOIDED. VISIBLE MATERIALS INCLUDE SUCH ITEMS AS SIDEWALKS, ROADS, TERRACES, TREES, SHRUBS, AND LAWN AREAS. ONCE INSTALLATION IS COMPLETE, PROVISION MUST BE MADE FOR MAINTENANCE. TIME AND COST EFFICIENCY SHOULD BE THE MAIN OBJECTIVES OF SUCH A PROGRAM. (RH)

ED014864

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

THE SCHOOL SITE --- ITS SELECTION, ANALYSIS, DEVELOPMENT AND MAINTENANCE

By: Walter F. Bruning, A.S.L.A.
Landscape Architect Consultant
Jacobsen Manufacturing Co.
Racine, Wisconsin

A manuscript prepared for the American Association of School Administrators Annual Convention, Atlantic City, New Jersey, February 16, 1966.

SITE SELECTION

THE MASTER PLAN ---- When the pressing need for new school facilities arise within a community, the search for an adequate site has become an increasingly complex problem. The confusing issue of where to find appropriate open land is the direct result of our population explosion coupled with topographic barriers and the limited boundaries of so many of our communities.

An easy answer to the problem of school site selection does not exist. However, a "helping hand" can very often be found in THE MASTER PLAN prepared for many of our communities under the state and federally aided 701 program. This program provides a complete analysis of the existing conditions of every facet of the communities physical characteristics as well as governmental functions.

For example, topography is analyzed along with soil conditions, existing and future highway programs, population trends, land use, open space, zoning, utilities, community facilities, park and recreation areas, condition of structures and capital improvement programs.

The school program of each locale is carefully studied with specific recommendations made for the number, size and location of future school plants.

All of this vital information can be a valuable aid to school administrators and school board members in solving the problem of site selection. But ---- too often a complete lack of liason exists between local planning bodies and school officials.

For example, I recently had the pleasure of discussing a new school site for a Central New York community with the school board members and the superintendent. My first question related to the existence of a MASTER PLAN for the city, but all in attendance knew nothing of such a plan. However, it was quite evident that a Master Plan had been executed for a large part of the central core of the city was in the process of demolition under an urban renewal grant. A prerequisite for urban renewal assistance in every community is the development of a MASTER PLAN.

The moral here is for all school officials to make a special effort to review the work of local planning boards and the consultants. Every MASTER PLAN represents many hours of hard work on the part of the planners extended over a period of two years. Closer cooperation between school administrators and community planners will do much toward easing the anxieties connected with the future of a communities school program.

<u>THE SEARCH FOR A SITE</u> ---- What are we looking for? The logical answer to this question is an ideally located, easy-to-develop parcel of land at the right price, within easy reach of all required utilities. Too often final acceptance of a school site is based upon the fact the land seems to be strategically located in regard to student population distribution and the many disadvantages so obvious to the qualified site planner are completely overlooked. For example, how often have we seen school developments, because of a lack of sound site selection principles, faced with the following mistakes:

1. A remote site requiring an extravagant road and walk system costly to install and maintain.
2. A site lacking space for future expansion resulting in the ultimate need for costly duplication of facilities elsewhere.
3. A site with excessive grades resulting in serious development and maintenance problems.
4. A highly exposed site where excessive winds cause snow removal problems and difficulties in sustaining lawns and plants.
5. A site with poor surface and subsurface soil conditions resulting in higher initial construction costs.
6. A school site surrounded by nuisances on adjacent property which tend to "cast a pall" over community efforts to create a superior school facility.

Remember ---- Many of the mistakes listed above will not only result in higher construction costs, but more important, will plague school administrators with a long series of costly maintenance problems.

ALTERNATE SITES ---- Rarely is the parcel of land that we may look upon as the most advantageous easily obtainable, so we must select and weigh the good and bad points of alternate sites.

Assuming that we know what we are searching for, carefully list all pertinent features necessary for the new school and follow this with a long and careful search of the area in question.

A great many aids are available to help in the tedious task of searching-out suitable locations such as:

1. Aerial photographs
2. Road Maps
3. Transportation facilities maps
4. Local zoning maps
5. Local planning commission data
6. Local urban renewal information
7. City and County, plan books
8. City, County, Township or Borough maps
9. State, County and City highway programs
10. Recreational information
11. U. S. Geological Survey maps

Of the above, the U. S. Geological maps will prove to be the most valuable aid in thoroughly analyzing any area. The maps are readily obtainable at local stationery stores or directly from the U. S. Geological Survey Department in Washington, D.C. for a nominal charge. The maps are quite detailed indicating topography, wooded areas, lakes, streams, swamps, roads, railroads, bridges, parks, cemeteries, schools, churches and other structures. With the maps as a reference, thoroughly explore the entire community by automobile. Do not hesitate to leave the car and "tramp" the sites to get a real "feel" of the land.

If available, consider the use of a helicopter to get a "slow motion" aerial view of the community. Not only will it enable you to carefully study terrain and traffic patterns, but will also make one immune to water hazards, fences and posted signs.

In the process of inspecting the area and selecting alternate sites, be sure to carefully itemize the advantages and disadvantages of each location. The use of a camera will also enable you to make a series of photos of each area for reference during the discussion of the pros and cons of each site following the field trips.

Carefully following the preceding suggestions relating to school site selection can erase many doubts regarding the choice of an optimum location, but what of professional assistance?

THE PROFESSIONAL SITE PLANNER ---- School administrators would hesitate undertaking the design of a building without the assistance of a qualified architect. The detailing of the rooms require the special touch of the interior decorator. The complexity of the school kitchen requires the talent of the kitchen planner. But ---- how often is the qualified site planner called upon by school officials to aid in site selection? Remember ---- for every piece of land there exists an ideal use, and for every use there is an ideal site.

The critical need for properly relating use to site can only be derived through a complete understanding of land planning principles as well as an understanding of land forms. Too often school administrators look to professionals with background and experience confined to structural development for solutions to the problems relating to locating the optimum site. Many problems resulting from this approach can be avoided by selecting professionals who possess a complete understanding of the land. They in turn must see that their knowledge is well-related not only to structural development within the boundaries of the site and existing and future character of surrounding areas, but also well-related to the efforts of the social, economic and political planners who play a part in shaping "land destiny".

SITE ANALYSIS

WHAT IS IT ---- WHAT WILL IT DO? - Assuming that in the process of searching for a new school site, careful consideration of alternate locations has narrowed the choice to one area, what then is the next step in the development program?

A thorough analysis of all physical aspects of the property combined with a careful study of the character of the surrounding neighborhood must logically be the next step. This step is what the Landscape Architect or Site Planner term SITE ANALYSIS.

The careful analysis of the site and its surroundings will always culminate in a development that is properly wedded to the land. The conscious or perhaps more often the subconscious appeal of the school development, is the direct result of the pleasant feeling that the development seems to be a natural outgrowth of the site. Each and every facet or the total complex must seem to belong to the land as opposed to being forced upon the ground.

A BASIC TOOL ---- THE SITE SURVEY

To completely understand the physical characteristics of the site, a boundary survey and topographic map must be prepared by a Licensed Land Surveyor. The topographic information is necessary to gain a complete picture of the lay of the land. The existing contour of the ground combined with all the physical features, both above and below grade, will affect the final location and form of the proposed development.

A good method for obtaining an accurate site map containing all of the critical information is through the use of an outline specification for the surveyor to follow. The specification should request the following information.

1. Title of the survey, location of the property, the north point, scale of the drawing the engineer's certification.
2. The lengths and bearings of all property lines.
3. The building setbacks lines, easements and right-of-ways.
4. The right-of-way lines of all bordering public roads.
5. The exact location and description of existing building or other structures on the property.
6. Location and description of walls, fences, drives, roads, curbs, gutters, steps and sidewalks.
7. Permanently establish one or more bench marks or datum.
8. Location and size of all underground utilities on or near the site. Indicate the rim elevation and inverts of all manholes and catch basins.
9. Locate all fire hydrants, meter boxes, water shutoffs and gas valves.
10. Locate all overhead utilities, including poles for electric power, telephone and street lighting.
11. Locate all ponds, streams, drainage channels and low-wet areas.
12. Locate accurately and properly identify the species and condition of all trees three inches in diameter and over. In heavily wooded areas, accurately indicate the edge of the tree line.
13. Establish the elevations of all existing roads at the center line and road edge at fixed intervals of from 20 to 50 foot centers.
14. Establish the actual ground elevations on a grid pattern at an interval suitable to the size and character of the property. Indicate elevations at the top and bottom of all sharp breaks in the topography.

15. Indicate the contour lines at one or two foot intervals.

16. Permanently set all property line corners with sections of metal pipe.

WALK THE LAND ---- THE PERSONAL SURVEY

With the aid of the boundary survey and topographic map, the effort spent in the personal inspection of the site begins to take on the feeling of greater accomplishment.

The boundaries of the property, the existing traffic flow, the views, the movement of the sun, the prevailing winds, the existing trees ---- all of these features that make the property a favorable site, take on new meaning.

Remember ---- only by walking the land time and time again can we begin to sense the proper location and orientation of the proposed structure. The logical location of the new approach roads, pedestrian walks, parking area, service areas and recreational facilities suddenly become quite apparent. In short, the hopeless feeling of what to do and where to do it that plagued us earlier has suddenly vanished as the pieces of the development "puzzle" rapidly fall into place.

PRELIMINARY SITE STUDY ---- A DIAGRAMATIC PLAN

The completion of the engineer's survey and the on-site inspections should be followed by the development of a rough sketch plan usually termed a site analysis diagram. The diagram can be superimposed on a print of the survey and should include additional information to supplement the engineer's survey data. The supplemental information should relate to such pertinent factors as:

1. The direction of the best views from the property as well as the bearing of objectionable views that we may choose to "turn our back on" or screen-out.

2. Indicate the trees which should be preserved and trees in poor condition that should be removed.
3. The distance and general direction of nuisances on adjacent property.
4. That portion of the property which may prove best for building location.
5. The best possible locations for entrance roads and exits.
6. Existing features which may give protection from prevailing winds or hot summer sun such as hills or heavy tree growth.
7. The position of the summer and winter sun in the morning and afternoon.
8. The direction of the prevailing winds.
9. An analysis of the micro-climate of the locale. Remember - in any given area, neighborhood climatic conditions will vary with elevation and exposure.
10. The depth and condition of the topsoil.
11. All other features peculiar to the site such as burrow pits, areas stripped of topsoil, rock outcrops and etc.

Finally, additional technical data relating to local zoning restrictions and utilities must also be included on the preliminary study, such as:

1. The normal gas and water pressure.
2. The capacities of the existing sanitary and storm sewers.
3. Data on proposed utilities.
4. The power capacities of existing lines.
5. Traffic volume data available from local and state highway departments.
6. Zoning restrictions relating to building setbacks, density, parking requirements, entrance road locations, signs and etc.
7. Soil Boring Data - The borings will determine subsoil conditions and will have a strong bearing upon the final design of such things as building foundations, underground utilities, subsurface drainage and etc.

UNDERSTANDING THE SITE ---- WHAT CAN IT DO?

It is not the author's intention to make landscape architects or site planners of school administrators. However, as long as the major part of school grounds development rests in the hands of professionals skilled in structural design, some basic knowledge of proper site development must become a part of the administrator's vocabulary. A lack of a basic understanding of the proper relationship of structure to site has been a major factor in inefficient school grounds development.

A proper site analysis will always result in a comprehensive development program that will ideally blend new structures to the land with the least amount of site modification, the least amount of wasted building dollars and a reduction in the seasonal maintenance problems that will continue to grow if proper site analysis is ignored at the outset.

EFFICIENT GROUNDS ---- THE FORGOTTEN ELEMENT

The modern day school has taken on many new roles and responsibilites, and its activities are no longer confined to the building, but extend to every corner of the property. The school site, in particular, has actually taken on an importance that rivals the structure itself. Diversified professional assistance has been used extensively by administrators in developing efficient, easy-to-maintain buildings containing the finest materials and labor-saving devices. But how about the grounds?

Despite the time and thought devoted to building design, one fault is still as prevalent in school grounds development today as it was years ago - LACK OF PLANNING ! Often the expenditure of large sums of money on the site has not produced satisfactory results. The end product may well be a cluttered site, lacking in visual appeal, and worst of all - - - in spite of well intended efforts - the grounds may be a nightmare to maintain.

THE COMPONENTS OF THE SITE ---- THEIR PURPOSE

The grounds of every school development are composed of three basic areas: The approach area, the service areas, and the outdoor living areas. Let us analyze each of these components.

1. The Approach Area

The first thing visible to the general public as he nears a school development is the approach area. The "front door" appearance of the school grounds will always be a positive indication of community concern for healthy economic growth and - good or bad - will always create a lasting impression with those who may be planning to relocate home or industry to any given area.

Be certain all approach roads are wide enough for heavy equipment such as snowplows which should be able to maneuver without backing up.

All walks must be amply wide to prevent students from trampling the adjacent grass and tromping out their own footpaths.

Bus loading areas must be spacious enough to prevent waiting students from spilling over into adjacent grass areas or plant beds. Wide turning radii will prevent damage to walks, curbs and adjacent grounds.

An excellent school approach area does not have to be a tricky "eye catcher", but should be a simple, well-designed, functional approach with special emphasis on safety and efficiency-of-operation.

2. The Service Areas

The service portions of the school site include parking areas, roads, areas for receiving daily truck deliveries, and storage areas for maintenance equipment.

Parking areas must be designed for the safe and easy maneuvering of all vehicles. Each parking bay must be wide enought to permit easy access to and from the parked car. In addition, curbing should be used to control the use of parking areas; preventing damage to adjacent structures by careless drivers.

All on-site roads must certainly be wide enough to accommodate two passing vehicles comfortably. Design all turning radii for the comfortable and safe maneuverability of large buses and snow plows. Proper sight distance must be maintained at corners and road intersection. Always avoid "blind" intersections too near building walls or intersections smothered in heavy plantings.

Areas for receiving daily truck deliveries must, for safetys sake, be located well away from out-of-doors play areas and well screened from the same. Always provide ample paving for safely backing the trucks around. Curb the entire area to prevent the trucks from damaging adjacent lawn areas, plantings or building walls.

The importance of attaining good traffic control, and related pedestrian safety, through proper design, can not be over-emphasized.

3. Outdoor Living Areas

The outdoor living areas of the school site are composed of athletic fields, paved play areas, court games, running tracks and etc. Always provide adequate areas for each age group to prevent excessive wear and maintenance on adjacent lawns.

Provide practice athletic fields to give the main fields an occasional rest and time for proper maintenance and reconditioning. Consider the use of resilient composition materials for paved play areas, court games and running tracks. The composition materials will reduce injury on play areas and on running tracks will eliminate weed growth characteristic of cinder tracks. The quality of the outdoor living area will directly affect the overall appeal of the school development. Mistakes are not easily corrected. Plan wisely and well at the outset!

LANDSCAPE MATERIALS ---- Invisible and Visible

So far our discussion has centered on the major areas of the school site. Now, let's briefly discuss the materials used in proper grounds development - both below ground and above ground.

1. The Invisible Materials

The invisible materials on the school site include all of the underground utilities such as: Storm drainage lines, water supply lines, electrical wiring, gas lines and telephone conduit. Very often the quality of the material used in underground utilities is reduced or installation may be poorly executed. This is definitely not the area in which to stress economy. Faulty or inadequate storm sewer facilities can cause many headaches during heavy periods of precipitation. Inadequate watering facilities will affect the appearance of lawns and plantings during prolonged dry spells. The lack of underground wiring and lighting may result in the need for "tearing the site apart" later on to add the additional lighting.

Always pinpoint the exact location and depth of all underground utilities.

Record this information accurately so it will be readily available for reference at a later date. Knowing exactly where utilities are located will not only prevent accidents if additional work is required in the future, but will enable you to locate trees and shrubs well away from these features.

2. The Visible Materials

There are two categories of visible materials to be considered in the development of the school site, "hard" materials such as walks and drives, and "green" materials such as plants and turf.

a) The "Hard" Materials

The "hard" materials include: Sidewalks, roads, terraces, curbing, fencing, steps, retaining walls, free-standing walls, handrails, lighting fixtures, and playground equipment.

The type of construction and the materials used in developing all of the items in the fore-mentioned list can vary considerably. However, a bargain "hard" material is rarely a real bargain. Curbing, for example, can vary considerably in initial cost depending upon the type selected. Inexpensive curb lacks durability, and the need for eventual removal and re-installation will far exceed the cost of using quality curbing at the outset.

The long lists of available materials for "hard" surface installation may prove to be quite confusing, but when durability and ease-of-maintenance are factors used in determining your selection, the list narrows considerably.

b) The "Green" Materials

The "green" materials used in the school site include trees, shrubs, groundcover, flowers and the lawn areas.

Although personal preference in the selection of plants will always be a factor, the first and most important point to consider is ---- will it grow in your area? Remember ---- climatic condition vary from state to state and even from neighborhood to neighborhood. You must consider soil conditions, water requirements, the amount of sunlight or shade required and whether the plant needs shelter or can survive in an exposed situation.

Avoid plants which require constant care. The most luxuriously planted school can soon become an eyesore and hardship if it requires excessive maintenance.

Finally, the overall appearance of your entire development will hinge upon the quality of your lawn areas. The best rule for establishing a healthy lawn is to sow quality seed into rich top soil and use a grass variety which grows well in your area. Follow this with a sustained program of fertilizing, frequent applications of weed and insect controls, systematic watering, thatch removal and proper mowing techniques with proper mowing equipment.

GROUNDS MAINTENANCE ---- PLAN AHEAD

From all of this, I am sure that you can see that grounds maintenance is no longer a case of sending a man out with a mower. It has become more complex along with the increasing size and function of school grounds. Because of this increased size and importance of the site, maintenance must be a prime consideration from the very beginning and continue through every step of planning. Reducing maintenance time and costs

must be a major factor in the selection of maintenance equipment and in the proper utilization of manpower in operating the equipment. Finally, the grounds should be laid out for power maintenance which wrings the utmost efficiency from these machines.

A final thought always worth remembering in developing school grounds is "KEEP IT SIMPLE" ! Simplicity will always result in design that not only looks well, but is easy-to-maintain. Remember --- beauty is a by-product of efficiency. If your grounds function properly - are safe and require a minimum of upkeep - the site will always be attractive.

LANDSCAPE MATERIALS

The success or failure of every school will depend upon the careful selection of all materials used in developing the grounds. With this in mind, let's analyze the advantages and disadvantages of the basic surface materials and determine their relationship to maintenance.

1. ROAD SURFACE MATERIALS (PAVING)

For minimum care, all roads - regardless of the type of surface, must be installed on a properly designed base. A poorly constructed base always results in continual surface patching and the eventual need for resurfacing the entire wearing course.

Surface materials most commonly used in road construction are:

A. Concrete

B. Bituminous Asphalt (Blacktop)

C. Petetrated Surface (Oil and Stone)

A. Concrete

Because it does require the extensive use of reinforcing steel and careful forming, concrete is considered the most expensive type of surface. For minimum upkeep in colder climates, sealers and hardners must be applied to provide protection from salt deterioration.

B. Bituminous Asphalt (Blacktop)

Low initial cost makes blacktop the most widely used surface for school roads. Its flexible nature reduces the development of breaks and cracks making it the ideal paving on areas that have been filled.

The use of surface sealers on blacktop are highly recommended. A sealed surface will prevent the drying of the natural oils and reduce the penetration of moisture. Without a seal coat, water will collect in low spots in the road base and frequent freezing and thawing during the winter months will result in "potholes".

Never install blacktop on a slope exceeding 10 per cent (one foot rise in ten feet of horizontal distance) because it is impossible to get proper compaction with a heavy road roller. A poorly compacted base course will eventually show a "washboard effect" in the paved surface.

For long road life, always apply a coating of hot asphalt emulsion to the road base before installing the paved surface. Without the emulsion, the dry base will "bleed" oil from the blacktop causing premature crumbling.

C. Penetrated Surface

This type of paving consists of crushed stone bound and rolled after the application of hot liquid asphalt. It is not considered a durable surface for bi-annual applications of stone and oil are required to maintain the paving. Its low cost and informal appearance make the penetrated road ideal for limited-use service lanes in the remote areas of the school grounds. We do not recommend its use on roads having storm drainage systems because loose stone will collect in catch basins resulting in frequent need for cleaning the basins.

2. CURBING MATERIALS

Curbing is used for the control of traffic, drainage and runoff. Also, for the protection of building, ground features and road edges. It is

available in a variety of materials, but the basic types include:

A. Granite

B. Concrete

C. Blacktop

A. Granite Curb

Granite, the most costly curb, is virtually indestructible. However, because it requires no maintenance, its initial cost will prove to be an inexpensive investment in the long run.

A point in favor of its use, is the fact that it can be picked up, moved and reinstalled if roads or parking areas require future changes.

B. Concrete Curb

Concrete can be used with a great degree of success in the more temperate regions of our country. In areas subject to severe winters, mechanical damage caused by snow plows and salt deterioration will result in disintegration of the curbing. The need for eventual removal and replacement of concrete curb will far exceed the costs of using granite curb initially.

C. Blacktop Curb

Blacktop curb is installed with a special machine designed for this purpose. The machine extrudes the curb and the quality of the final product depends upon the texture of the asphalt mix. A course mix will result in surface cracks and eventual crumbling of the curbing.

The plastic nature of asphalt makes this type of curb susceptible to mechanical damage. Unlike concrete, however, the damaged sections can be easily cut-out and replaced.

Like an asphalt road, the life of blacktop depends upon the retention of the natural oils. A tack-coat of hot asphalt emulsion must be applied to the road surface prior to the installation of the curb to prevent the loss of the oils.

D. Free-Standing Curb

Free-standing curb is available in a variety of materials including wood, metal and precast concrete. We never recommend its use because it is easily knocked about by heavy trucks and plows. Also, because the curbing is free-standing, it is difficult to mow close to the back of the curb resulting in the need for frequent hand trimming of the grass.

3. SIDEWALK AND TERRACE MATERIALS

Materials used in walk and terrace construction include:

A. Concrete (Standard)

B. Blacktop

C. Exposed Aggregate Concrete

D. Flagstone and Brick

A. Concrete

Concrete is the most acceptable material for the more formal areas near structures, but its durability depends upon the method of construction. A two course walk (one inch mortar topping on a three inch concrete base) produces the most durable surface. The mortar wearing course retards the spalling of the exposed face so common in one course walks due to the proximity of the aggregate (stone) to the surface. In order to achieve maximum bond, the one inch topping must be applied within thirty minutes of the base installation.

Concrete walks are subject to movement resulting from temperature changes. Failure to install expansion joints (asphalt or plastic strips) at regular intervals to compensate for this movement will result in cracks and breaks.

In snow regions, a silicone coating should be used to protect the walks against salt deterioration.

B. Blacktop Walks

Blacktop walks are ideal for the informal character of the naturalistic areas of the school grounds. It is easier to install than concrete and its flexibility makes it less subject to temperature changes or failure caused by the movement of the ground in areas of heavy fill.

The edges of blacktop walks should be bound with a metal edge. The metal will not only produce a neater appearance, but will also eliminate edge breakage often caused by heavy maintenance equipment.

C. Exposed Aggregate Concrete

Exposed aggregate concrete walks can prove to be very attractive depending upon the color and texture of the stones or pebbles used on the surface. The extensive use of this type of paving is questionable in areas subject to severe winters. Heavy snow removal equipment will loosen the surface stone causing rapid deterioration. If it must be used, hardners and sealers are necessary to prolong the life of the surface course.

D. Flagstone and Brick

Flagstone and brick are commonly used for large plazas or terraces. Great care should be taken so that only the highest grade flag is used. The color of the stone will determine quality. Poor quality stone is light

grey in color and comes from near the surface of a shallow quarry. Its lack of density will result in spalling and chipping. High quality flagstone is usally a deep blue-grey color and its high density will yield a maintenance-free surface.

As a surface material, brick can produce interesting color, texture and patterns. If it is installed on a bed of sand or "stone dust", it must be carefully laid with tight joints to prevent weed growth. Brick should not be laid on concrete in cold climates. Because of its porous nature, it will absorb water which will freeze in winter, causing the bricks to loosen.

4. RETAINING WALLS

The three basic types of walls used to reduce steep grades are:

A. Concrete Walls with or without Veneers

B. Dry Walls

C. Cribbed Walls.

A. Concrete Walls with or without Veneers

Poured concrete walls with stone or brick veneer should require next to no care because it combines the sturdiness of concrete with the durability of a brick or stone surface. Drains or "weeps" should be provided through the wall to prevent the buildup of water pressure and subsequent buckling. Special attention must also be paid to proper installation of expansion joints to allow for movement in the concrete due to temperature changes.

The exposed face of a plain concrete wall is always subject to surface deterioration. If a tight budget forces you to delete the stone or brick veneer, provide a stone shelf slightly below finished grade for the future addition of a veneer in the event the exposed surface should eventually fail.

B. Dry Walls

Dry walls (stone walls without mortar) are not recommended for minimum maintenance on school grounds. If dry walls must be used, the individual stones should be massive enough to prevent the removal of the stones by vandals. Finally, never build a dry wall higher than five feet in area subject to extreme frost action.

C. Cribbed Walls

The bulky nature of concrete cribbing is associated with heavy landscaping of highways and railroad embankments and, therefore, should not be a part of school development. In addition, the voids in the cribbing are always subject to the development of weed growth.

5. EXTERIOR STEPS

Exterior steps should be avoided when possible, but if they are required, they must be less steep than indoor steps. A satisfactory "rule of thumb" for exterior step construction is a maximum riser height of six inches and a tread depth of fourteen inches.

For safety and durability, stone steps are the unanimous choice. It has a better non-skid surface, and can withstand mechanical and salt damage.

6. HANDRAILS

Handrails should be used alongside all exterior steps, but they can be a

major maintenance problem if they require frequent care and painting. The best material is an anodized aluminum rail which requires no painting and, unlike regular aluminum, resists corrosion. Never install aluminum rails in iron pipe sleeves for iron, in direct contact with aluminum, will cause the aluminum to deteriorate. The easiest and best method of installation is to drill the holes for upright members directly in the surface of the stair treads.

7. FENCE MATERIALS

Aluminum chain link fencing requires no painting or other maintenance. Galvanized steel fence, will in time, lose its protective coating and require constant painting. Protective coatings, such as plastics, add to the practicability of steel fence, but this can wear off, requiring eventual painting.

Because aluminum is not as strong as steel, the size of the aluminum line posts must be increased in diameter over the pipe size normally used for steel posts.

8. EXTERIOR LIGHTING MATERIALS

Lighting fixtures for both roads and walkways should be considered that do not require painting or time consuming light replacement. Aluminum fixtures are now used so extensively that their initial cost is competing favorably with steel poles. But, unlike steel, they require no painting.

The incandescent luminaire has given way to mercury vapor or flourescent fixtures. The small size of the mercury vapor lamp makes it much less subject to damage by vandals than the large flourescent fixtures.

DEVELOPING LAWNS FOR MINIMUM MAINTENANCE

The first requirements for a good looking, rugged, easy-to-maintain turf are excellent soil and top grade seed or sod.

Soil Preparation

1. Provide adequate drainage.
2. Apply at least four inches of topsoil. (Deeper in play areas and athletic fields)
3. Provide healthy soil by adding needed ingredients determined by soil analysis.
4. Improve soil texture by adding peat moss or other inorganic matter.
5. Thoroughly cultivate area and fine grade in preparation for seeding.

Grass Selection for Minimum Maintenance

1. Keep to one or two basic grasses.
2. Select grass suitable to your climate.
3. Choose grass with the following maintenance characteristics in mind:
   a. Should be insect-resistant.
   b. Can withstand disease.
   c. Is drought-resistant.
   d. Can take heavy traffic.
4. The use of sod or "instant grass" is heavily recommended for quickly establishing healthy turf. Its advantages:
   a. Provides finished lawn ready for use.
   b. Prevents washouts common to seeding.
   c. Requires less topsoil and preparation.
   d. Can be purchased practically weed-free.

MAXIMUM MAINTENANCE LAWN PROGRAM

1. Develop a sustained program of fertilizing and feeding.
2. Use weed and insect controls.
3. Do not try to grow grass where it won't. (Heavily shaded areas, heavily traveled areas, on steep slopes, or under roof overhangs.)
4. Develop a systematic watering program. Include an automatic watering system, if possible. Provide convenient water outlets to turf areas. Water at appropriate times.
5. Recondition lawns at regular intervals -- fall and spring. Control excessive compaction in heavily traveled lawn areas by frequent spiking, aerating and general renovating. Use lawn renovators to remove thatch and permit air, water and fertilizers to easily reach grass roots. Top dress lawn areas yearly, where needed. This helps to maintain level surface and prevents compaction.

6. Use proper mowing techniques.

   a. Set mower at high cut in the hot summer months.

   b. Use alternating mowing patterns to eliminate grain effect.

   c. Keep mower sharp to eliminate discoloration of lawn and injury to grass.

   d. Use land plan method for cutting large areas with big equipment.

7. Use proper equipment

PLANT MATERIALS

Simplicity is the key note in all school plantings. An enormous variety of plants does not necessarily enhance appearance, and will cause untold maintenance. A simple planting scheme can be tastefully designed and still be effectively maintained by relatively inexperienced maintenance personnel.

Factors for Low Maintenance Plantings

1. Select plants on the basis of maintenance required.
2. Use hearty species requiring little care.
3. Space plants to allow room for their ultimate size.
4. Obtain healthy nursery stock from a reputable nursery. Healthy plants require less care and will not have to be replaced.
5. Provide the best possible soil for planting to insure healthy plant.
6. Avoid trees producing litter - fruits, nuts, seed pods and large flowers. These present an overall eyesore, nuts can become a mowing hazard and overripe fruit can produce a really messy situation.
7. Avoid plants prone to insect damage or disease.
8. Avoid plants that require constant pruning, trimming or shaping.

Always remember - quality must be stressed in the selection of landscape materials. Many times the sidewalk, road surface or plant that costs a little more at the beginning will pay for itself many times by far outlasting inferior material and by requiring little or no maintenance.

GROUNDS MAINTENANCE

The use of durable landscape materials and sound basic planning will limit many of the serious problems evident in today's school grounds. However, the use of the finest materials will never completely eliminate the need for occasional preventative maintenance nor eliminate the need for seasonal chores such as; turf care, weed control, snow and leaf removal, plant materials care and general clean up operations.

The men an methods used in completing these seasonal chores will always directly effect the overall appearance of the school grounds. Inexperienced personnel, improper equipment and poor maintenance methods can quickly destroy a costly and time consuming site development program.

MAINTENANCE PERSONNEL ----

The total investment in the school site can reach staggering proportions and yet too often the care of this costly investment is entrusted to inexperienced help. Every square foot of paving, each tree, and every square yard of lawn represents many dollars and simple errors in basic maintenance methods by unqualified maintenance personnel can quickly destroy the beauty and years of effort put into each of these outdoor features.

Well maintained school grounds will always depend upon well informed - rigidly controlled maintenance crews. Administrative personnel must take the time to delegate each task to the individual employee for the successful completion of each chore. On every school, every member of the grounds maintenance staff must be given a well defined work area for which he alone is responsible. Only in this way will each member of the team show responsibility and pride in workmanship.

EQUIPMENT SELECTION ---- RELATE TOOL TO TASK

Grounds maintenance equipment can be divided into two categories: grass cutting equipment and lawn grooming equipment. The latter category includes equipment for edging, trimming, sweeping and general grounds cleanup.

Grass cutting equipment comes in a variety of sizes ranging from 18-inch power mowers to huge tractor types that can tow as many as 11 gangs for a 25-foot swath, and also come with a vast variety of accessories for other maintenance chores. The equipment must be suited to the job it is supposed to do, and the size of the school. Hand-pushed mowers are ideal for small confined lawn areas, while the larger equipment should be considered for the larger, unbroken expense of turf.

Larger, self-contained up-front mowing machines make possible a quick, quality cut of large areas because they leave a smooth surface with the complete absence of wheel marks. Because the cutting units are out in front of the operator, they also mean greater operating safety and the reduction of damage to trees and plant beds.

Multi-purpose equipment should be used, such as tractors which can tow an assortment of attachments in addition to mowing. Year-round maintenance also should be a factor in selecting equipment which will not only mow grass in the summer, but can spread fertilizer in spring, sweep leaves in fall, and clear snow in winter.

TIME SAVING TOOLS

Time studies have revealed some interesting comparisons of time savings with power equipment over hand tools. Also, some comparisons between different types of power tools to showhow proper use of power equipment and manpower can save man-hours and reduce maintenance budgets.

For example, some of these studies showed that lawn trimming with power is 20 times faster than hand trimming. That one snow thrower is worth 20 men with shovels. Power lawn edging is 12 times faster than by hand. That power hedge trimming is 8 times faster than hand trimming and power leaf sweeping is 10 times faster than hand raking.

A CASE HISTORY

Closer to the interest of school administrators is a time study showing how the use of one large capacity machine can be much more economical than the use of several smaller units. The tests took place on three large park areas in a midwest city. The comparison studies were made of one five-gang front-mowing unit and of three tractors towing three gang mowers.

The findings were very conclusive. The five-gang machine completed the job in 12½ hours, while the three smaller units took 21½ man-hours. The larger machine took almost one-half the time, and yet its initial cost was only one-half that of the other three units combined. Add to this the fact that three smaller units would take more than twice the amount of equipment maintenance as the larger, single unit, and you can see the economy of selecting the larger machine.

Although smaller equipment will always be a necessary part of a complete maintenance program, economy in maintenance on large resorts will always be achieved with large equipment rather than many smaller pieces which take more people, more time, more gas, more oil, more storage area, and require more machine maintenance to accomplish the same job.

However, while recommending the use of large equipment, we want to caution against becoming "over-powered". Don't send your largest unit out to cut a small, confined area which would be like driving a small nail with a sledge hammer. A well-balanced maintenance staff must have equipment to effectively handle the various maintenance requirements posed by the school grounds.

The administrative personnel and maintenance department must keep abreast of the equipment available and properly fit it to the job. The mobility of equipment also should be considered. Most of the large maintenance vehicles today have transport gears so they can move rapidly from one part of the resort to another.

TIME SAVING TIPS

With proper design and proper application of materials, many difficult and time consuming problems can be eliminated or appreciably reduced. The following list contains some of the more obvious recommendations for reducing maintenance - many of which can be added to the grounds at anytime:

1. Provide for continuous mowing by avoiding sharp corners and angles around plant beds and building corners.
2. Use concrete, brick or stone mowing strips against buildings, walls and under fencing to eliminate hand trimming.
3. Keep lawn areas flush with paved surfaces such as walks and terraces to avoid unnecessary trimming and provide easier movement of maintenance vehicles.
4. Eliminate hand trimming around trees by using grass barriers or metal edgings. This will also reduce tree damage from mowers.
5. Use a section of flush paving around lawn obstructions such as fire hydrants, light poles, sign posts and sewer vents. This can eliminate hand trimming and speed-up power mowing.
6. Avoid impossible-to-mow situations. Use low maintenance groundcover on steep slopes and bumpy or rough areas.
7. Locate water outlets conveniently. Handling of excessive lengths of hose should not be required to water lawns and plants. The absolute minimum in maintenance would be an automatic sprinkler system.
8. Provide for the free movement of maintenance-equipment from one area to another. All roads, walks, ramps and entrances should be planned wide enough to accomodate equipment.
9. Avoid trying to grow grass in "impossible situations" - in heavily shaded areas, heavily traveled areas or under roof overhangs.
10. Keep lawns clear of unnecessary obstructions. Keep shrub and plant beds out of lawn areas in order to achieve a continuous mowing pattern.

Finally, we hope that the control of maintenance costs through proper landscape design will be a basic consideration with every school. Only with properly designed grounds, and with efficient maintenance programs will our schools be able to keep pace with the growing responsibility of maintaining the proper physical character of large land areas within our nation.